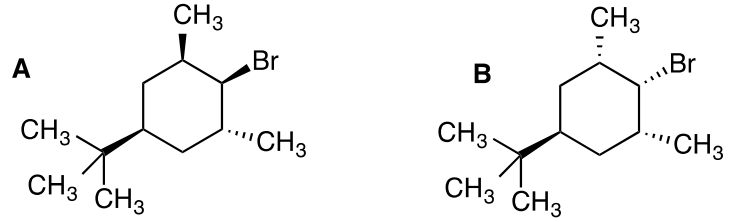
Final Exam - Long Island University

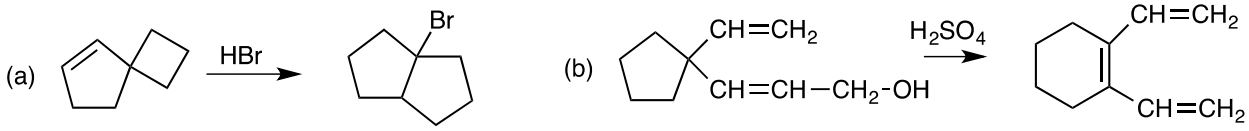
Chem. 121, Sect, 007 and 008 Fall, 2014, 250 points

1. Draw the following molecules (a) E-4-bromo-3-methyl-2-penten-1-ol. (b) 1-chloro-3-methyl-4-isopropylcyclohexene (c) the Newman projection looking down the C3-C4 bond for the low energy conformation of 2,2-dimethyl-4-phenylbutane. (15 pts)

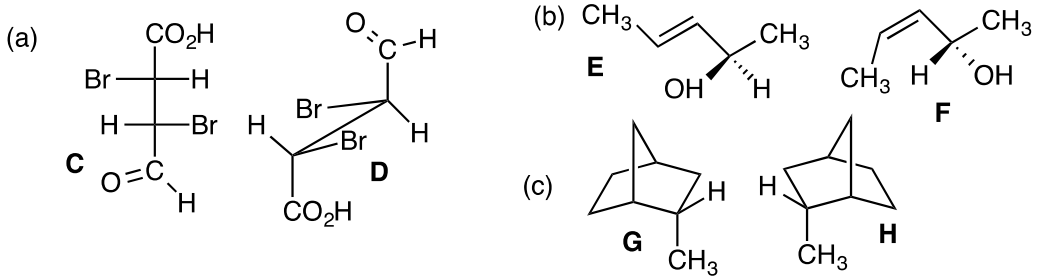
2. Which molecule would react faster with sodium methoxide in methanol ($NaOCH_3/HOCH_3$)? Explain by making careful three-dimensional chair drawings of the starting materials, giving the complete reaction mechanism in each case and giving the major product(s) in each case. (25 pts)



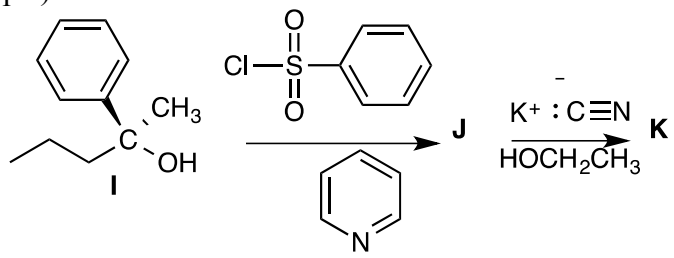
3. Show how the following rearrangements occur. No other reagents are needed except those given over the arrow. (20 pts)



4. Give the relationship between the following pairs of molecules. They may be constitutional isomers, different molecules, diastereomers, enantiomers or the same molecule. (20 pts)



5. (a) Assign the absolute configuration to compound **I.** (b) Give the product that is formed, along with the reaction mechanism, when optically active **I** is treated with phenyl sulfonyl chloride in the presence of pyridine as shown. (c) Give the absolute configuration of this product (molecule **J**). Is it optically active? Explain briefly. (d) Give the product and the complete mechanism when **J** is treated with potassium cyanide in ethanol. (e) Is this product optically active? Explain briefly. (20 pts)



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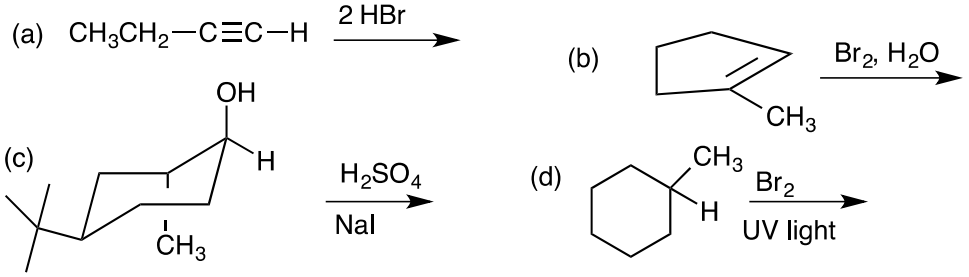
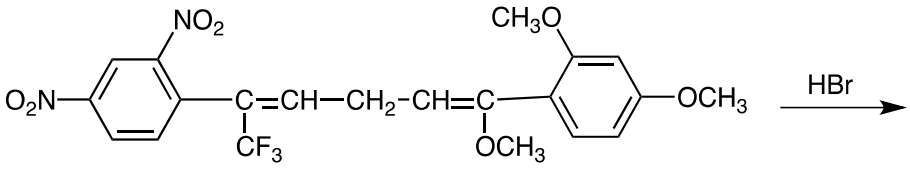
6. Give the product and complete reaction mechanism for the following reactions. Pay particular attention to stereochemistry in (b) and (c). (60 pts)



7. When the following reaction is performed at -78°C only one major product is formed. Show this product and show the mechanism by which it is formed and briefly explain why this is the only major product. (15 pts)



8. Aniline (or aminobenzene) typically gives a mixture of *ortho* and *para* alkylation products when treated with $CH_3Cl/AlCl_3$. Explain why the *ortho* and *para* products are preferred over the *meta* by showing the reaction mechanism for *ortho* and *meta* alkylation and explaining why the *ortho* case is lower in energy. You do not need to show *para* alkylation. You do need to show all the resonance structures involved. (15 pts)

9. Synthesize **four** of the following molecules from the starting materials given on the left as shown. Do all **five** for extra credit. (60 pts)